

Nuclear Material Stabilization Project Overview and Technology Needs

Presentation to the National Academy of Sciences Environmental Management Roadmap Committee

Patrick W. McGuire, Assistant Manager
Nuclear Material Stabilization Project
Savannah River Operations Office

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Agenda

- Nuclear Materials Program Overview
 - Surplus Enriched Uranium Program
 - Spent Nuclear Fuel Program
 - Surplus Non-Pit Plutonium Program
- Technology Development Needs

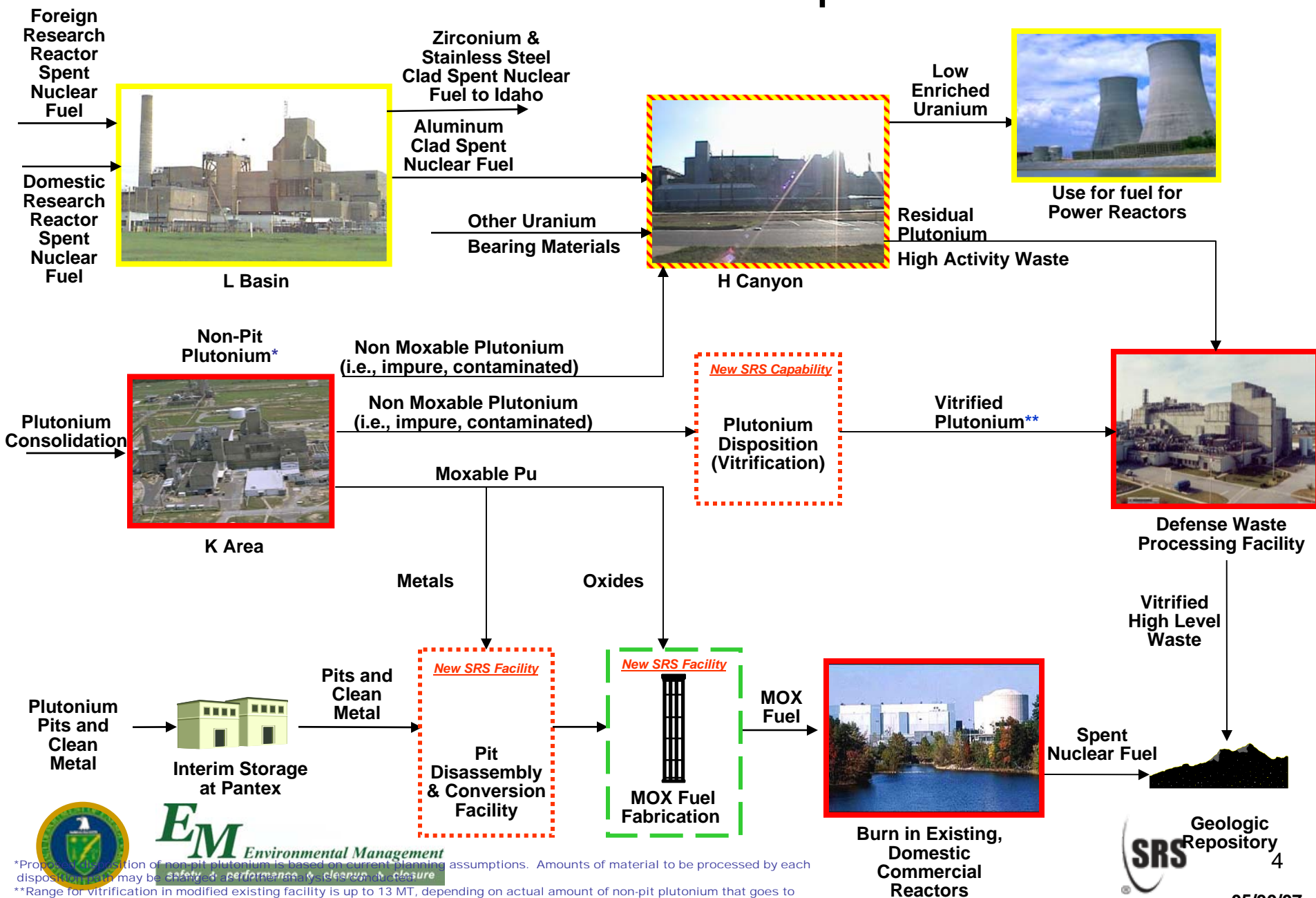


Surplus Enriched Uranium Program

- The Department of Energy identified ~ 21 Metric Tons (MT) of surplus weapons-usable Highly Enriched Uranium (HEU) and ~ 2 MT of surplus non-pit Plutonium (Pu)
 - 19,500 spent nuclear fuel assemblies containing HEU
 - 7.5 MT of HEU materials
 - 2 MT of Pu, including material that cannot be dispositioned via Mixed Oxide (MOX) Fuel Fabrication Facility or Pu Vitrification Facility
- Department established Enriched Uranium (EU) Disposition Project
 - August 2006, Deputy Secretary of Energy approved the continued operation of H-Canyon as the preferred alternative for dispositioning these materials
- HEU materials are planned to be dissolved, blended down to LEU, and provided to an end user



Plutonium and Uranium Disposition Process



Spent Nuclear Fuel (SNF) Program

- Savannah River Site (SRS) is currently storing aluminum, stainless steel, and zirconium clad fuels in L-Area
- SRS continues to receive fuel from both the Foreign Research Reactors and from Domestic Research Reactors
- As part of the HEU Disposition Project, DOE will perform a SNF fuel exchange with Idaho
 - SRS will receive all the al-clad fuel from Idaho for dissolution in H-Canyon
 - SRS will ship the stainless steel and zirconium clad fuels to Idaho for disposal



Surplus Non-Pit Plutonium Program

- SRS is storing significant quantities of plutonium materials that were generated at SRS and received from the former Rocky Flats Site
- DOE has began the consolidation of surplus non-pit plutonium to the Savannah River Site from:
 - Hanford
 - Los Alamos National Laboratory
 - Livermore National Laboratory
- The majority of the materials have been stabilized and packaged in accordance with DOE-STD-3013 for long-term storage
- Savannah River Site is performing both non-destructive and destructive examinations of 3013 containers to ensure safe storage
- Disposition or repackaging material for long-term storage



Surplus Non-Pit Plutonium Program

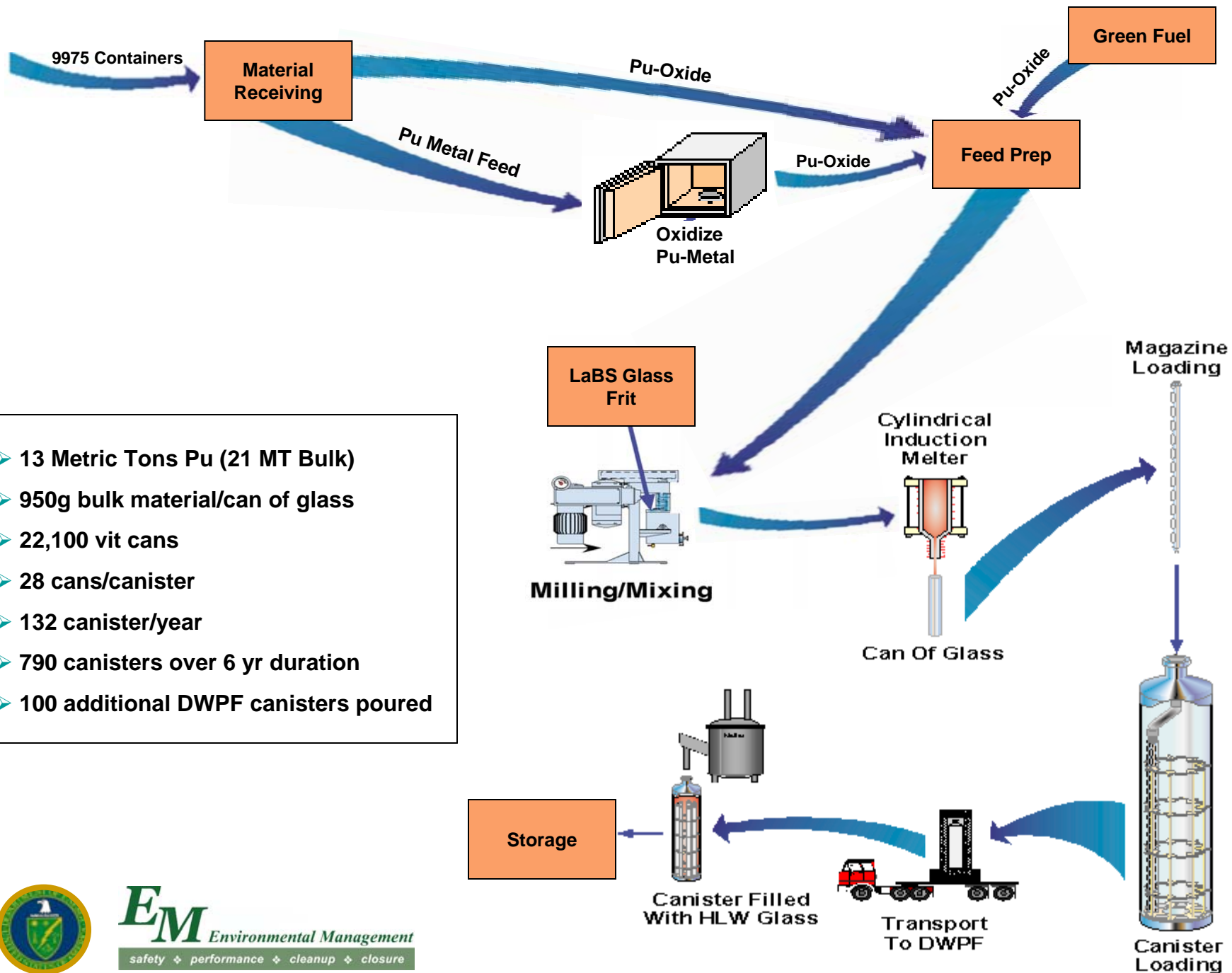
- DOE's integrated plan for disposition of surplus plutonium involves:
 - ~ 2 MT: H-Canyon facilities (currently operating)
 - ~ 4 MT: MOX Fuel Fabrication Facility (under construction)
 - ~ 7 MT: Small scale plutonium vitrification process (proposed)



Technology Needs

- Well understood and defined disposition processes for:
 - Surplus HEU Program
 - SNF Program
 - Surplus (2 MT) Non-Pit Plutonium Program
- Technology Challenges
 - Evaluating alternatives for Plutonium Vitrification Process
 - Obtain advice on technology needs to assist in selecting alternatives or improvements to vitrification





- 13 Metric Tons Pu (21 MT Bulk)
- 950g bulk material/can of glass
- 22,100 vit cans
- 28 cans/canister
- 132 canister/year
- 790 canisters over 6 yr duration
- 100 additional DWPF canisters poured



Technology Needs

- Plutonium Disposition Project
 - Pu Metal Oxidation Furnace with Stabilization capability
 - Glass qualification testing
 - Dustless Material Transfer
 - Modular Sand Filter
- 3013 Container Surveillance and Storage Capability (CSSC) Project
 - 3013 Outer Can Welder



Technology Needs

- Plutonium Disposition Project
 - Pu Metal Oxidation Furnace with Stabilization capability
 - Furnace technology must be demonstrated to ensure proper design as early in the project as possible to ensure an adequate number of furnaces are incorporated into the design to handle the throughput. Also need to have the capability to stabilize Pu material (per the DOE-STD-3013 standard) as anomalous material is discovered.



Technology Needs

- Plutonium Disposition Project
 - Glass qualification testing
 - PuD Project must test and generate compliance documentation required per Waste Acceptance Documentation, and qualify waste to meet requirements Defense Waste Processing Facility and geologic repository.
 - Dustless Material Transfer
 - Explore using a dustless transfer valve common to the pharmaceutical industry (it is an integral part of the complete furnace technology)



Technology Needs

- Plutonium Disposition Project
 - Modular Sand Filter
 - The main cost driver for the project is a full size sand filter estimated to be about ~ \$100M. The project could greatly benefit from a safety class sand filter that would be modular in nature that allows adding filtration capacity as additional projects are added to the K-Area facility.



Technology Needs

- 3013 Container Surveillance and Storage Capability Project
 - 3013 Outer Can Welder
 - The project has a need for outer can welder that is compliant to the DOE-STD-3013 standard and takes advantage of current technology innovations.



Summary

- Well understood and defined disposition processes for:
 - Surplus HEU Program
 - SNF Program
 - Surplus (2 MT) Non-Pit Plutonium Program
- Technology Development Needs
 - Plutonium Disposition Project
 - 3013 CSSC Project

